U.S. Environmental Protection Agency

Clean Energy

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Solid Waste Generation

Some electricity generation technologies result in the creation of solid waste. In some cases, this waste is disposed of in landfills. In other cases, this waste may contain toxic and hazardous elements and materials that require special handling, treatment, and disposal, as described below. Certain electricity generation technologies, however, produce no solid waste, or very insubstantial amounts. The specific solid waste impacts for each energy generation technology are described below.

Natural Gas

The use of natural gas to create electricity does not produce substantial amounts of solid waste.

Coal

The burning of coal creates solid waste, called ash, which is composed primarily of metal oxides and alkali.[1] On average, the ash content of coal is 10 percent.[2] Solid waste is also created at coal mines when coal is cleaned and at power plants when air pollutants are removed from the stack gas. Much of this waste is deposited in landfills and abandoned mines, although some amounts are now being recycled into useful products, such as cement and building materials.

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Oil

Oil refining produces wastewater sludge and other solid waste that can contain high levels of metals and toxic compounds. Also, when oil is burned at power plants, residues that are not completely burned can accumulate, forming another source of solid waste that must be disposed.

Nuclear Energy

Every 18 to 24 months, nuclear power plants must shut down to remove and replace the "spent" uranium fuel.[3] This spent fuel has released most of its energy as a result of the fission process and has become radioactive waste.

All of the nuclear power plants in the United States together produce about 2,000 metric tons per year of radioactive waste.[4] Currently, the radioactive waste is stored

at the nuclear plants at which it is generated, either in steel-lined, concrete vaults filled with water or in above-ground steel or steel-reinforced concrete containers with steel inner canisters. In addition to the fuel waste, much of the equipment in the nuclear power plants becomes contaminated with radiation and will become radioactive waste after the plant is closed. These wastes will remain radioactive for many thousands of years.

Uranium processing produces radioactive wastes that must be adequately stored and isolated to minimize the risk of radioactive release. The management, packaging, transport, and disposal of this waste is strictly regulated and carefully controlled by the U.S. Nuclear Regulatory Commission EXIT Disclaimer and the U.S. Department of Transportation. EXIT Disclaimer

Municipal Solid Waste

The burning of MSW in boilers creates a solid waste called ash, which can contain any of the elements that were originally present in the waste. MSW power plants reduce the need for landfill capacity because disposal of MSW ash requires less land area than does unprocessed MSW. However, because ash and other residues from MSW operations may contain toxic materials, the power plant wastes must be tested regularly to assure that the wastes are safely contained to prevent toxic substances from migrating into groundwater supplies. Under current regulations, MSW ash must be sampled and analyzed regularly to determine whether it is hazardous or not.[4] Hazardous ash must be managed and disposed of as hazardous waste. Non-hazardous ash may be disposed of in a MSW landfill or recycled for use in roads, parking lots, or daily covering for sanitary landfills.

Hydroelectricity

The use of water to create electricity does not produce a substantial amount of solid waste.

Non-Hydroelectric Renewable Energy

Solar Solar-thermal technologies do not produce any substantial amount of solid waste while creating electricity. The production of photovoltaic wafers creates very small amounts of hazardous materials that must be handled properly to avert risk to the environment or to people.

Geothermal Geothermal technologies do not produce a substantial amount of solid waste while creating electricity.

Biomass The burning of biomass in boilers creates a solid waste called ash that must be disposed of properly. However, the ash from biomass normally contains extremely low levels of hazardous elements.

Landfill Gas Landfill gas technologies do not produce any substantial amount of solid waste while creating electricity.

Wind Wind technologies do not produce any substantial amount of solid waste while creating electricity.

1. U.S. Department of Energy, Energy Efficiency and Renewable Energy Network, *Glossary of Energy Terms*. EXIT Disclaimer
2. U.S. Department of Energy, Energy Efficiency and Renewable Energy Network, *Energy, Environmental, and Economics Handbook*. EXIT Disclaimer

3. Nuclear Energy Institute, Fact Sheet: *Nuclear Energy and the Environment*. July 2000. EXIT Disclaimer
4. U.S. Department of Energy, Energy Information Agency, *Nuclear Power Generation and Fuel Cycle Report 1997*.